Report to the Legislature

Light Brown Apple Moth

2007

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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cdfa
CALIFORNIA DEPARTMENT OF
FOOD & AGRICULTURE
A. G. Kawamura, Secretary

February 15, 2008

Joint Legislative Budget Committee
Senator Moreno Ducheny, Chair
1020 N Street, Room 553
Sacramento, CA 95814

Attn: Peggy Collins

Re: 2007 Report on the Status of the Light Brown Apple Moth Program

The Department of Food and Agriculture is pleased to present the enclosed report to the Legislature on status of the Light Brown Apple Moth Program as required by Senate Bill 556.

The report summarizes the nature of the pest problem, an accounting of the expenditures, progress and ongoing priorities in combating the light brown apple moth in California.

If I can be of assistance, please do not hesitate to contact me.

Sincerely,

John Connell
Director

Enclosures

cc: A. G. Kawamura, Secretary, CDFA
Eric Stein, Deputy Secretary of Legislation, CDFA
Bob Wynn, Pierce's Disease Statewide Coordinator, CDFA
Jack Wright, Chief, Budget Office, CDFA

2007 Report to the Legislature
The Light Brown Apple Moth Act of 2007
Status of the Light Brown Apple Moth Program

Executive Summary

Senate Bill 556 requires the Department of Food and Agriculture (Department) to submit a report on the light brown apple moth program to the Legislature regarding its expenditures, progress and ongoing priorities in combating the light brown apple moth in California. Through Senate Bill 556, the Legislature declared that to avoid potentially catastrophic loss to some of California's most important industries and native species, the addition of the light brown apple moth program to the Food and Agricultural Code is in the interest of the public health and welfare.

The first recorded detection of the light brown apple moth (LBAM) in North America occurred in February 2007 in Berkeley (Alameda County). The implementation of an increased and extensive trapping array throughout California revealed LBAM infesting residential areas, nurseries, croplands and forests in Alameda, Contra Costa, Los Angeles, Marin, Monterey, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz and Solano counties (Attachment 1).

Based upon the known climatic zones of infested origins, and the distribution of similar climatic zones in California, it is likely that the pest will successfully adapt to the climate of this state if the infestation is not eradicated. To develop an eradication strategy, the United States Department of Agriculture (USDA) assembled a technical working group of subject matter experts from the United States, Australia and New Zealand. Their charge is to provide recommendations on survey methods, mitigation tools and eradication strategies.

In May 2007, the USDA convened this LBAM Technical Working Group (TWG) to review the LBAM situation in California. The TWG's overriding recommendation is that the Department and the USDA adopt a goal of ultimately eradicating the LBAM from California. The TWG provided recommendations for the development of a multi-faceted eradication program involving detection protocols, regulatory actions, treatment strategies and research priorities.

By the spring of 2007, the detection and quarantine measures were firmly established. In the summer, the Department initiated eradication measures. Isolated outlier infestations were treated by ground using an organic insecticide and with twist tie ropes infused with a mating disruption pheromone. Out of 15 areas that were treated by ground, LBAM has been declared eradicated in five areas. The other 10 areas are still under treatment.

Trapping data indicates that there are over 500,000 LBAM infested acres that require treatment. The size of the LBAM infestation is too large to treat by ground within a biologically meaningful timeframe. This required the Department to aerially apply mating disruption pheromone in portions of Monterey and Santa Cruz counties.

The Department's objective is to eradicate the LBAM from California in order to avoid devastation to the state's agricultural and environmental areas. To achieve eradication, the project will implement new tools and technologies as they are developed.

Background

The Light Brown Apple Moth

The LBAM is native to Australia, but has successfully invaded New Zealand, New Caledonia, Hawaii and the British Isles. The first recorded detection of the LBAM in North America was detected in Berkeley (Alameda County) in February 2007. The LBAM is an exotic insect pest of quarantine significance to both this Department and USDA that attacks more than 2,000 host plants (Appendix 1). It attacks nearly all types of fruit crops, ornamental plantings, vegetables and nursery stock. LBAM causes economic damage from feeding by the larvae. The pest destroys, stunts and deforms young seedlings; spoils the appearance of ornamental and native plants; and injures deciduous fruit-tree crops, citrus and grapes. During severe outbreaks, damage to fruit can be as high as 85 percent of the crop. In addition to direct damage caused by the LBAM, California's export markets will suffer due to the implementation of quarantines by foreign and state governments.

Because LBAM is not known to occur in the continental United States, it does not have any natural enemies to keep its population in check. It is considered highly likely that LBAM will become permanently established in the United States if eradicative measures are not implemented. The consequences of its establishment for the United States agricultural and natural ecosystems were judged to be severe.[1] California's climate will support a continuous breeding population that could lead to its permanent establishment in the state.

Program Description

The Department is charged with control and eradication of invasive pests and diseases. Pest prevention is uniquely positioned to protect California's urban and natural environments as well as its agriculture. To minimize the statewide impact of LBAM, the Department's strategy is to contain, suppress, eradicate and ultimately simultaneously developing other mitigation tools that can be used as part of program, such as, attracticide technology, sterile insect release technology, mobile mating disruption, and biological control organisms.

[1] Robert C. Venette, Erica E. Davis, Michelle DaCosta, Holly Heisler and Margaret Larson, *Mini Risk Assessment, Light Brown Apple Moth,* University of Minnesota, Department of Entomology, September 21, 2003.

This strategy relies upon the following elements:

1. **Statewide detection**
   Place LBAM traps throughout the state to detect new infestations of LBAM while at low population levels. Early detection will increase the probability of eradicating small incipient populations.

2. **Quarantine and containment**
   Prevent the spread of LBAM to new areas of the state by regulating shipments of host plants and material.

3. **Rapid response**
   Respond quickly to detections of LBAM in new areas by intensively trapping the area and applying eradicative treatments. Apply eradicative treatments to the small outlier infestations, the areas with the heaviest LBAM detections and in the southernmost areas where LBAM has been detected.

4. **Research**
   Identify potential sources of the infestations; develop treatment alternatives, biological control organisms and the sterile moth technique.

Organization

The LBAM project is a Federal and State cooperative program that includes the Department and the USDA, in coordination with the county agricultural commissioners, other state and local agencies, industry and agricultural organizations throughout the state. The program is administered by the director of the Division of Plant Health and Pest Prevention Services in accordance with the policies and priorities set forth by law and the Secretary of the Department. Program staff are located at satellite facilities in Watsonville, San Jose and Albany. They are responsible for coordinating and implementing the program operations. They work in conjunction with the county agricultural commissioners to ensure the program activities are conducted in accordance with all statutory and regulatory requirements. An insect biosystematist at the Department's Plant Pest Diagnostics Center identifies all of the LBAM detected.

Advisory Groups

The LBAM program has formed the following advisory groups:

- **Technical Working Group (TWG)**
  The Technical Working Group is comprised of representatives from the scientific and academic community and individuals with extensive experience regarding eradication of invasive species. This group provides recommendations to the Secretary of the Department and the Secretary of the USDA regarding feasibility and tools to achieve eradication of the light brown apple moth.

- **Environmental Advisory Task Force**
  The Environmental Advisory Task Force is comprised of representatives from numerous environmental and research-oriented organizations. Secretary Kawamura

chairs the task force, and the task force keeps him informed about environmental concerns in regard to the LBAM eradication program, possible mitigating factors and research into new control and eradication methods.

- **California Department of Pesticide Regulation (CDPR)/ Office of Environmental Health Hazards Assessment**
  The California Department of Pesticide Regulation provides consultation to the Department regarding pesticide registration issues for materials used in the eradication of the LBAM. The Office of Environmental Health Hazards Assessment provides consultation to the Department regarding the potential health effects of materials used in eradication efforts.

Additionally, both groups developed a joint document that analyzed the available health and safety data of the pheromone products associated with the LBAM eradication program. Their summary: "the toxicity data on the pheromone active ingredients, as well as on microencapsulated pheromone product formulations, suggest that exposure to a high dose of airborne Checkmate microcapsule particles could cause eye, skin, or respiratory irritation. The application rates were extremely low, and it is likely that exposure occurred at levels below those that would be expected to result in health effects."

Statewide Detection

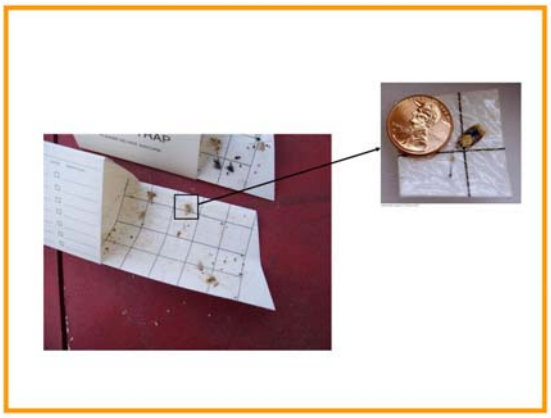
Following the first detection of the LBAM in Berkeley, the Department in cooperation with the United States Department of Agriculture (USDA) and the California agricultural commissioners (CAC) immediately launched an intensive and extensive trapping array throughout the state to determine the extent of the infestation. The program is designed to locate new LBAM infestations quickly, and verify that uninfested areas remain free from LBAM.

An inspector placing a LBAM trap.

To comply with the Federal Domestic Quarantine Order, DA-2007-42, the LBAM Project continues to monitor over 41,000 LBAM traps throughout the state. These traps are strategically and systematically placed targeting commercial, residential, nurseries, croplands and forested areas of the state. Because LBAM has never been detected in California, at the recommendation of the LBAM Technical Working Group, traps were placed within the infested counties to determine the phenology[2] of LBAM in California (Table 1). Finds that are three miles from any other detection site are intensively trapped (delimitation trapping) to determine if an infestation is present. Within 72 hours of the detection, 300 additional traps are placed in a nine square mile area to monitor the LBAM activity in the area.

[2] The study of cyclical biological events, such as breeding, in relation to climatic conditions.

The results of this trapping effort revealed LBAM infestations in Alameda, Contra Costa, Marin, Monterey, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz and Solano counties. Single moths detected in Napa and Los Angeles County were treated and eradicated. An additional single moth was detected in San Luis Obispo County, and is now monitored under a high density trapping array. The rest of the state remains LBAM-free.



Light brown apple moth

Table 1. Statewide LBAM Trap Deployment

Trap Type							Total Traps	Total LBAM Trapped
Forest	Phenology	Ports	Delimitation	Nursery	Cropland	Detection		
663	45	37	9,449	4,538	2,548	23,804	41,084	16,280

This trapping array will continue throughout the state in 2008.

Quarantine and Containment

A federal domestic quarantine order and parallel state interior quarantine restrict the movement of LBAM hosts from portions of the following counties: Alameda, Contra Costa, Marin, Monterey, San Francisco, San Mateo, Santa Clara, Santa Cruz and Solano counties. Incipient infestations in portions of Los Angeles and Napa counties were eradicated and both counties have been removed from federal and state quarantines. Currently, over 1,200 square miles are under quarantine.

The quarantines restrict the movement of hosts within and out of the quarantine areas. Regulated host articles such as nursery stock, assorted fruits and vegetables, cut flowers and greenery, Christmas trees, hay and green waste must comply with the movement restriction prior to moving within and out of the quarantine areas. The quarantine includes provisions requiring regulated host articles to be: inspected and found free of LBAM; originate from a premise that has been trapped and found free of LBAM; grown under an integrated pest management system; or, moved under specific conditions to a specific location and processed in an approved manner. Infested hosts

or premises must be treated or reconditioned and reinspected and found free of LBAM prior to movement.

Persons or businesses in the quarantine that wish to move regulated host articles within and out of the quarantine area may sign a compliance agreement with their local regulatory official (i.e., the county agricultural commissioner or the Cooperative LBAM Project) in order to self-certify their hosts for movement. The local regulatory officials conduct periodic inspections and oversight visits of all entities operating under compliance agreements in order to verify compliance.

Rapid Response

The primary objective of the rapid response component quickly and efficiently eradicates incipient infestations of the LBAM. The trapping data revealed small isolated infestations that were treated using ground treatment techniques. To eradicate these infestations, joint emergency responses by the USDA, the Department and county agricultural commissioners began in June 2007.

The treatment program uses chemicals and mating disruption applied by ground and aerially, depending on the size of the infestation. Eradication of LBAM requires a systems approach using multiple tools, including applications of mating disruption pheromone, use of insecticide treatments and other technologies still under development.

Using the tools available, in 2007, the eradication strategy had two main components:

- Treating the heaviest populations beginning on the Monterey coast and moving to the Santa Cruz area.
- Treating the small outlier infestations.

Communication with elected officials, stakeholders and informational open house meetings

To inform the state, county and local officials of the LBAM problem, the Department formed an informational team made up of California's Plant Health Director for the USDA, the Director for the Plant Health and Pest Prevention Services Division, a medical coordinator, an environmental specialist, an entomologist and an information officer from public affairs office. This informational team presented the LBAM program and the eradication plans for each city that received any type of treatment against the LBAM. Following these meetings, a press release was issued once treatment dates were determined informing the public of the LBAM problem and the areas scheduled for treatment.

Food and Agricultural Code, Section 5771 – 5780, specifies the actions that must occur in notifying residents and physicians in the area that is scheduled to be treated. Prior to the first treatment in any area, residents, local officials and elected officials are invited to an informational open house. This meeting provides the residents an opportunity to

learn about the treatment that will be occurring in their neighborhood and ask specific questions. Program, health and environmental specialists are present to answer questions. **For the 2007 campaign, 14 informational open houses or public meetings were held in the treatment areas.**

Residents in the treatment area are notified via door-to-door notification, direct mail and the media. The notice contains the date and time of the treatment, the type of pesticide to be applied, any health and safety precautions and a telephone number for residents to call for any additional information. The Department also introduced an e-mail update notification system. On the evenings of scheduled aerial applications, the Department e-mailed subscribers the areas to be treated. On the mornings following treatment, the Department e-mailed subscribers with the results of the just-completed application.

Prior to any treatment, the Department's environmental scientist reviews the Natural Diversity Database to determine if any threatened and endangered species are present within the proposed treatment boundaries. Depending on the environmental concerns for a treatment area, the Department consults with the Department of Pesticide Regulation, Department of Health Services, California and United States Environmental Protection Agencies, the Department of Fish and Game and the United States Fish and Wildlife Service, National Oceanic and Atmospheric Administration and the Monterey Bay National Marine Sanctuary.

Ground Treatment Responses

Because LBAM was not known to occur in California, initially the only pesticide registered for use in the state was an organic formulation of *Bacillus thuringiensis (Bt).* This material is a naturally occurring biological insecticide that attacks the larvae and is commonly used on organic fruits and vegetables. Therefore, in June, the Department began ground treatments with *Bt.* Treatments were applied 200 meters around each of the small outlier infestations every two weeks (Table 2, Page 8).

By July, a twist tie formulation of the LBAM pheromone was registered in California. This new technology was quickly implemented to replace the *Bt* ground treatments. The twist tie treatment lasts a minimum of three months, thereby requiring fewer visits to each residency. The application of the twist tie treatment is very labor intensive,[3] therefore, this application is reserved for small outlier infestations. Any new outlier infestations are treated with the pheromone-infused twist ties (Table 2, Page 8).

[3] Each 200 meter radius requires 450 to 500 person hours to complete within a timeframe to prevent LBAM from breeding.

An inspector deploying twist ties.

A twist tie placed within a host tree.

To date, five of the outlier infestations have been eradicated and taken out of intensive regulatory restrictions (Table 2).

Table 2. Ground Treatment Results

Area	# of Bt Treatments	# of Properties Treated	# of Twist Ties Deployed	Result
Oakley	3	146	16,977	Eradicated
Napa	3	90	7,134	Eradicated
Danville	NA	NA	11,542	Eradicated
San Jose	NA	NA	7,225	Eradicated
Sherman Oaks	NA	NA	6,155	Eradicated
Dublin	NA	NA	Treatment #1 11,076 Treatment #2 11,126	Ongoing
Dublin	NA	NA	8,033	Ongoing
Pleasanton	NA	NA	9,043	Ongoing
Vallejo	NA	NA	7,900	Ongoing
Vallejo	NA	NA	5,274	Ongoing
Mare Island	NA	NA	6,827	Ongoing
Mare Island	NA	NA	2,851	Ongoing
Vallejo	NA	NA	6,412	Ongoing
Vallejo	NA	NA	8,933	Ongoing
Mare Island	NA	NA	3,132	Ongoing

The Department will continue to use twist ties in the small outlier infestations. As new technologies are developed and approved for use, they will be incorporated into the existing ground treatment plan.

Aerial Treatment Response

Trapping data indicates that there are over 500,000 LBAM-infested acres that require treatment. The situation in California is such that the size of the LBAM infestation is too large to treat by ground within a biologically meaningful timeframe. The Department must comply with all State and Federal laws and regulations when applying pesticides. Additionally, the Department is committed to conducting safe and effective eradication programs, employing the safest and most environmentally responsible strategy available. Department staff in consultation with the LBAM Technical Working Group, the USDA and in discussions with the county agricultural commissioners reviewed all possible eradication strategies currently available. Mating disruption via aerial application of a pheromone was selected.

Pheromones are used to disrupt the mating behavior of certain moths whose larvae (caterpillars) destroy crops and trees. Data indicates that these compounds do not present any known risks to humans or the environment.[4] Although there was public controversy around use of applying the mating disruption pheromone by air, there are environmental and organic farming groups supporting this program and the use of pheromones rather than a traditional pesticide.

In September, mating disruption pheromone[5] treatments began in Monterey County, the southernmost infested area. In October, the mating disruption pheromone specific to the LBAM[6] became available. This formulation was applied in Monterey and Santa Cruz counties (Table 3 and Attachment 1) in October and November.

In October, twin engine King Air-Turbo prop fixed winged aircraft were used to apply the mating disruption pheromone. Aircraft flew at an attitude of 500 to 800 feet above ground level at speeds of 161 to 172 miles per hour. The aircraft are equipped with an Ag-Nav II guidance system. This system uses electronic signals from fixed sources or navigational satellites. Pilots are also equipped with night vision goggles, optimizing their vision during night time operations.

Loading treatment aircraft with pheromone

The aerial treatment with the pheromone raised much public concern over the inert ingredients in the CheckMate®. On October 10, 2007, a Monterey County judge issued

[4] *Lepidopteran Pheromone Fact Sheet,* United States Environmental Protection Agency, Updated on December 20, 2007.
[5] CheckMate® OLR-F, EPA Registration Number: 56336-25. Applied at the rate of 20 grams of active ingredient per acre. Application rate was 32 ounces of dilute product per acre.
[6] CheckMate® LBAM-F, EPA Registration Number: 56336-7009-EU. Applied at the rate of 15 grams of active ingredient per acre. Application rate was 32 ounces of dilute product per acre.

a temporary restraining order stopping the Department's aerial release of the pheromone due to public health concerns over the safety of the pheromone. In response to the temporary restraining order, the Department suspended the treatments pending a hearing and a court ruling. The Department provided the required information and on October 19, 2007, the temporary restraining order was lifted and the eradication treatments resumed. In November 2007, CDPR and the Office of Environmental Health Hazard Assessment performed a repeat review of the CheckMate® materials and concluded that they were not likely to have caused the reported illnesses.

Requests for temporary restraining orders were also denied by the Santa Cruz Superior Court and Federal District Court. In court cases to date challenging the program, plaintiffs failed to prove that CheckMate® products caused the reported illnesses.

Following each night's treatment, maps were posted on the Department website showing the previous night's treatment activities and the area where treatment was completed. In Monterey County, 99,803 acres were treated with the mating disruption pheromone (38,540 acres were treated twice), and in Santa Cruz County, 27,350 acres were treated once (Table 3 and Attachment 1).

Despite the CDPR and the United States Environmental Protection Agency (USEPA) clearing the CheckMate® products for use, the Department received 330 reports of illness blamed on the aerial treatment with the CheckMate® products. Local opposition groups continue to raise concerns about the program to local, state and federal officials.

Table 3. Aerial Treatment

Area	Pheromone Treatment #	Treatment Dates	Acres Treated
Monterey	1	9/9/07-9/13/07	38,540
Monterey	2	10/24/07-10/26/07	38,540
Santa Cruz	1	11/8/07-11/9/07	27,350
Prunedale	1	11/9/07, 11/11/07, 11/12/07	13,120
Salinas	1	11/9/07, 11/11/07	9,603

Aerial applications of mating disruption pheromone will continue in 2008 in order to keep LBAM from spreading to new areas and to ultimately eradicate LBAM from the state. The Department will continue to treat the infestation in Monterey and Santa Cruz counties. Improved formulations of the mating disruption pheromone are being developed. These new formulations will be tested in Australia and/or New Zealand for efficacy. The Department is committed to using the safest and the best formulation of the mating disruption pheromone.

Environmental Monitoring

Prior to the onset of any pesticide applications, the Department consulted with the CDPR to determine the necessary environmental monitoring requirements. Staff from the Environmental Monitoring Branch of the CDPR assessed each treatment area to

determine the type of monitoring required to determine the fate of pesticides and to protect the public and the environment from pesticide contamination. The following tests were performed by CDPR during the aerial treatment program:

- *Pesticide Screening* – To assure that all equipment used on the project were free from any pesticides or contaminants, all of the tanks, hoses, valves, spray booms, nozzles, pumps, water trucks, pipes and fittings, were tested prior to the first treatment. These samples were analyzed at the Department's Center for Analytical Chemistry for any pesticide residues or contaminants. All equipment tested negative for any contaminants or pesticides.
- *Pesticide Mixing* – Representative samples were taken of the mixed product to ensure that the correct concentration of CheckMate® OLR-F and CheckMate® LBAM-F was used. Samples were taken from the tanks and from the spray booms.

- Deposition cards[7] were placed in various locations such as schools, public areas, on residential areas (on plants within a yard) and at the Monterey Bay National Marine Sanctuary.
- *Run Off* – CDPR was onsite to identify any run off issues. There were no run off issues encountered.

At the conclusion of the project, the CDPR provides environmental monitoring data required for emergency eradication projects.

Due to concerns of possible discharge of pheromone into the Monterey Bay National Marine Sanctuary (MBNMS), a 48-hour acute toxicity test was performed using mussel embryos.[8] The tests determined that the CheckMate® LBAM-F is non-toxic to marine life. Therefore, the MBNMS issued the Department a "Further Natural Resource Value Permit."

In the Santa Cruz area, there were concerns over seabirds and marine mammal sensitivity to low flying aircraft. This area is within the MBNMS and is protected by Overflight Restriction Zones. The Department displayed the flight pattern and the number of times the aircraft would enter into this zone to the MBNMS. The MBNMS amended the permit that was issued for Monterey County to allow the Department to treat over this area and remain in compliance with National Oceanic and Atmospheric Administration regulations.

In addition to the CDPR environmental monitoring, the Department also monitored the area with dye cards throughout the treatment area. These dye cards were used to verify that the mating disruption pheromone was applied in the designated area. Staff also monitored wind speed every 30 minutes and reported any environmental changes (such as fog).

[7] These cards are 1'x1' and placed parallel to the ground to monitor where and how much of the pesticide is applied.
[8] The tests were conducted at the University of California at Davis, Granite Canyon Marine Pollution Studies Laboratory.

Research

Research is an integral part of the LBAM Project because no single eradication technique currently exists that can be practically, safely and effectively implemented over the entire LBAM-infested area. Therefore, the TWG recommends eradicating LBAM in a multi-faceted systems approach. As additional treatment methods are developed and approved for use in California, they will be implemented into the project.

Some treatments developed in Australia and New Zealand, such as the attracticide technology, will have to be modified for California conditions. Others, such as the sterile insect technique, will require various levels of development, experimentation and validation to make them functional and effective. The Department has developed a research plan with the following objectives:

- Expand upon and modify alternative methods to eradicate LBAM from California;
- Develop methods to control LBAM if eradication is not feasible;
- Develop data on the possible environmental impacts of any eradication or control method used by the LBAM Project;
- Develop an effective DNA fingerprint and identification technology for LBAM.

Expand upon and modify alternative methods to eradicate LBAM from California

A. Trichogramma Wasps

Trichogramma wasps will be purchased and released into a defined area to determine if the wasps will attack LBAM eggs and if so, whether the wasp larvae can complete their development in the LBAM eggs and produce viable adult wasps. In 2008, large numbers of wasps will be released in heavily infested areas in conjunction with mating disruption pheromone applications.

B. Attracticide Technology

Attracticide technology involves mixing the LBAM pheromone with an insecticide and a carrier. This matrix is deposited in large numbers by applying them in spot stations throughout an area. The male moths are attracted to the spots and are killed as they move over the pheromone spot laced with an insecticide looking for a female moth. This technology is used against other moths in the eastern United States. This technology can be used in conjunction with the release of Trichogramma wasps. This technology should be available in spring 2008.

C. Sterile Male Moth Technique

This technique involves mass breeding large quantities of sterile LBAM in a facility and releasing millions of sterilized moths over an infested area. The sterile male LBAM mate with wild female LBAM and no offspring are produced. With each generation, the population declines until they are eradicated. This technology will take a minimum of two years to develop.

Develop methods to control LBAM if eradication is not feasible

A. Trichogramma Wasps
Trichogramma wasps have been used to control moth pests. It is likely that growers could use these insects to reduce damage to their crops.

B. Classical Biological Control
Department scientists are working with the University of California researchers and with LBAM scientists in Australia and New Zealand to import LBAM parasites to evaluate their ability to attack LBAM and their preference for LBAM compared to native or naturalized leaf roller moth larvae. This technology will not occur for at least one year.

Develop data on the possible environmental impacts of any eradication or control method used by the LBAM Project

The Department has contracted with the University of California at Davis to evaluate the effects of the pheromone in various formulations on fresh water animals.

Develop an effective DNA fingerprint and identification technology for LBAM

Identify potential sources of the LBAM infestations. This will allow the Department to close the pathway to future introductions of LBAM in the state.

Develop efficacy data for alternatives to organophosphate pesticide treatments for LBAM-infested nursery stock.

The Department in cooperation with the USDA and Australian researchers are conducting pesticide trials in order to evaluate the efficacy of non-organophosphate pesticides against LBAM. Currently, organophosphate pesticides, such as chlorpyrifos, are the only class of pesticides that are effective and approved for use against all life stages of LBAM. The efficacy trials will focus on pesticides that are more environmentally friendly than organophosphate pesticides in order to provide infested nurseries additional, efficacious pesticide options for treating LBAM-infested nursery stock.

- **Research Accomplishment**

In California there are native moths in the same family as the LBAM. Since LBAM is not known to occur in California, a comprehensive key for identifying the larvae does not exist. Therefore, if larvae suspected of being LBAM were collected from commodities from within the quarantined area, they could not be sold until the commodities were treated with an approved treatment. To remedy this problem, the protocols for the molecular diagnosis of LBAM larvae were developed by the USDA, Pest Detection, Diagnostics and Management laboratory, in consultation with the Department's Plant Pest Diagnostics laboratory. By June 18, 2007, the Department was able to identify LBAM larvae using DNA sequencing.

Financial Statement

Fiscal Year 2007-08 Budget

Expenditures for July 1, 2007 – November 30, 2007

Expenditure	Budget	Total Expenditures	Balance	Description
Personnel Services				
Temporary Help Salaries	$3,000,000	$2,101,860	$898,140	
Benefits		$41,325	-41,325	
Operating Expenses				
General Expenses	$250,000	$170,657	$79,343	Field and office supplies, equipment rentals, general services charges
Communications	$15,000	$11,483	$3,517	Telephone and telecommunications support
Printing	$500,000	$236,618	$263,382	Treatment and public meeting notices, maps
Postage	$7,500	$4,241	$3,259	
Insurance	$1,000	$289	$711	
Travel	$500,000	$337,770	$162,230	Experienced staff for aerial, detection and regulatory operations, meetings, vehicle rental
Training	$500	$200	$300	
Facilities Operations	$158,705	$44,170	$114,535	Leases for space, trailers, portable toilets, garbage bins, security, hazardous waste
Interdepartmental Consult/Pro	$50,000	$32,233	$17,767	
Interdepartmental Chrg	$100,000	$89,965	$10,035	Chemical analysis
Indirect Chg/Recovery	$200,000	$105,046	$94,954	
Information Technology	$25,000	$13,763	$11,237	
Equipment	$50,000	$26,568	$23,432	Flow meters, pumps, computers
Other Items of Expense	$1,000,000	$691,277	$308,723	Pesticides, lures, aerial application services, temporary mixing/loading staging area, other operations
Total Net Program	**$5,857,705**	**$3,907,465**	**$1,950,240**	

Fund Sources	
General Fund	$2,000,000
Emergency Fund	$2,257,705
Federal Funds	$1,600,000
Total Funding	**$5,857,705**

APPENDIX

Partial LBAM Host List - Horticulture

Aaron's Beard	*Hypericum calycinum*
Acacias	*Acacia spp*
African Daisy	*Arctotis stoechadifolia*
Amaranths	*Amaranthus spp.*
Angel's Trumpet, Jimson Weed, Thorn Apple	*Datura spp.*
Arrow Grass	*Triglochin spp.*
Arrowwoods	*Viburnum spp.*
Astartea	*Astartea spp.*
Asters	*Aster spp.*
Australian Bluebells, Bluebell Creeper	*Sollya spp.*
Australian Fuchsia	*Correa spp.*
Baby's Breath	*Gypsophila paniculata*
Banana Passionflower, Passionfruit, Poka	*Passiflora mollissima*
Black Alder/European Alder	*Alnus glutinosa*
Black Locust	*Robinia pseudoacacia*
Black Thorns	*Bursaria spp.*
Bleeding Heart Vine, Bowers, Tubeflower, and Turk's Turban	*Clerodendron spp.*
Boronias	*Boronia spp.*
Bottle Brush	*Callistemon spp.*
Brake, Dish Fern, Table Fern	*Pteris spp.*
Broadleaf Dock	*Rumex obtusifolius*
Broomheaths	*Monotoca spp.*
Brooms	*Genista spp.*
Buck Brush, Wild Lilac	*Ceanothus spp.*
Bull Thistle	*Cirsium vulgare*
Buttercups, Crowfoot	*Ranunculus spp.*
Butterfly Bush	*Buddleia spp.*
Cabbage Tree	*Cordyline australis*
Calendula	*Calendula spp.*
Camellia	*Camellia japonica*
Canada Goldenrod	*Solidago canadensis*
Canada Thistle	*Cirsium arvense*
Capeweeds, Cape Dandelion	*Arctotheca spp.*
Carolina Jessamine	*Gelsemium spp.*
Cedar	*Cedrus spp.*
Chrysanthemums	*Chrysanthemum spp.*
Clematis, Virgin's Bower, Lather Flower, Vase Vine	*Clematis spp.*
Columbines	*Aquilegia spp.*
Common Sheep Sorrel	*Rumex acetosella*
Common Sowthistle	*Sonchus oleraceus*
Common Yarrow	*Achillea millefolium*

Partial LBAM Host List - Horticulture

Cotoneaster	*Cotoneaster spp.*
Cottonwood, Poplar	*Populus spp.*
Coyote Brush, Desert Broom	*Baccharis spp.*
Curled Dock	*Rumex crispus*
Curry plant, Licorice Plant, Straw Flower	*Helichrysum spp.*
Cypress	*Cupressus sp.*
Dahlia	*Dahlia spp.*
Douglas fir	*Pseudotsuga menziesii*
Dusty-miller, Groundsels	*Senecio spp.*
Escallonias	*Escallonia spp.*
Eucalyptus, Gum trees	*Eucalyptus spp.*
Euonymus	*Euonymus spp.*
Fat-hen	*Chenopodium album*
Fiddle Dock	*Rumex pulcher*
Fire Thorn	*Pyracantha spp.*
Flax	*Linum spp.*
Fleabane	*Conyza bilbaoana*
Fleece Flower, Knotweed, Smartweed	*Polygonum spp.*
Florist's Geraniums	*Pelargonium spp.*
Forsythias	*Forsythia spp.*
Fox's Brush, Heliotrope, Valerian	*Centranthus spp.*
Garden Sorrel, Spinach Dock	*Rumex acetosa*
Geebung	*Persoonia spp.*
Golden Shower, Pink Shower, Rainbow Shower and Gold Medallion Tree	*Cassia spp.*
Gorse	*Ulex europ aeus*
Grand Fir	*Abies grandis*
Greenbrier, Jacob's Ladder, Wild Sarsaparilla	*Smilax spp.*
Hawthorn	*Crataegus spp.*
Hebe	*Hebe spp.*
Hedge Mustard	*Sisymbrium spp.*
Holly	*Ilex sp.*
Honey Myrtle, Bottlebrush	*Melaleuca spp.*
Honeysuckles	*Lonicera spp.*
Hop Bush, Hopseed Bush	*Dodonaea spp.*
Hummingbird Bush, Grevilleas	*Grevillea spp.*
Ice Plant	*Mesembryanthemum spp.*
Ivy	*Hedera spp.*
Japanese Douglas Fir	*Pseudotsuga japonica*
Japanese Pieris or Andromeda	*Pieris japonica*
Japanese Zelkova	*Zelkova serrata*
Jasmine	*Jasminum spp.*
Jerusalem Artichoke	*Helianthus tuberosus*
Kamahi	*Weinmannia racemosa*

Partial LBAM Host List - Horticulture

Lady's Sorrel, Redwood Sorrel, Wood Sorrel	*Oxalis spp.*
Lancewood	*Pseudopanax sp.*
Lavenders	*Lavendula spp.*
Lawson's Cypress	*Chamaecyparis lawsoniana*
Lilac Vine	*Hardenbergia spp.*
Lupines	*Lupinus spp.*
Madrone, Strawberry Tree	*Arbutus spp.*
Maidenhair Ferns	*Adiantum spp.*
Mexican Orange	*Choisya spp.*
Mexican Palo Verde	*Parkinsonia aculeata*
Mexican sunflower	*Tithonia spp.*
	Trema spp.
Michelia	*Michelia spp.*
Mignonette	*Reseda spp.*
Milkworts	*Polygala spp.*
Mock Orange	*Philadelphus spp.*
Montbretia	*Crocosmia spp.*
Mugwort, Sage brush, Tarragon, Worm Wood, etc.	*Artemesia spp.*
Mums	*Chrysanthemum x morifolium*
Musk Thistle	*Cardus nutans*
Myoporum	*Myoporum spp.*
Native Parsnip	*Platysace spp.*
Nettles	*Urtica spp.*
New Zealand Christmas tree	*Metrosideros excelsa*
New Zealand Flax	*Phormium tenax*
Norfolk Island Hibiscus	*Lagunaria patersonii*
Oak	*Quercus spp.*
Periwinkles	*Vinca spp.*
Photinia	*Photinia spp.*
Pines	*Pinus spp.*
Pittosporums	*Pittosporum spp.*
Plucaria	*Pulcaria spp.*
	Pyllanthus spp.
Privet	*Ligustrum spp.*
Redwood	*Sequoia sp.*
Rhododendron	*Rhododendron spp.*
Roses	*Rosa spp.*
Sages	*Salvia spp.*
Scotch Broom	*Cytisus scoparius*
Shore Sowthistle	*Sonchus kirkii*
Silver Tree	*Leucodendron spp.*
Snow Bush	*Breynia spp.*
Spanish Heath	*Erica lustanica*

Partial LBAM Host List - Horticulture

Spiny Sowthistle	*Sonchus asper*
Spruce	*Picea spp.*
Sugi	*Cryptomeria japonica*
Sweet-amber	*Hypericum androsaemum*
Tea Trees	*Leptospermum spp.*
Trailing St. John's Wort	*Hypericum humifusum*
Transvaal Daisy	*Gerbera spp.*
Tree Tomato	*Cyphomandra betacea*
Trumpet Creeper, Trumpet Vine	*Campsis spp.*
Velvet Ash	*Fraxinus velutina*
Virginia Mallow	*Sida spp.*
Wax Flower	*Eriostemon spp.*
Western Red Cedar	*Thuja plicata*
White Tea Tree	*Kunzea ericoides*
Willow	*Salix spp.*
Wintersweet	*Chimonanthus sp.*
Woodbine, Virginia Creeper	*Parthenocissus spp.*

Partial LBAM Host List - Agriculture

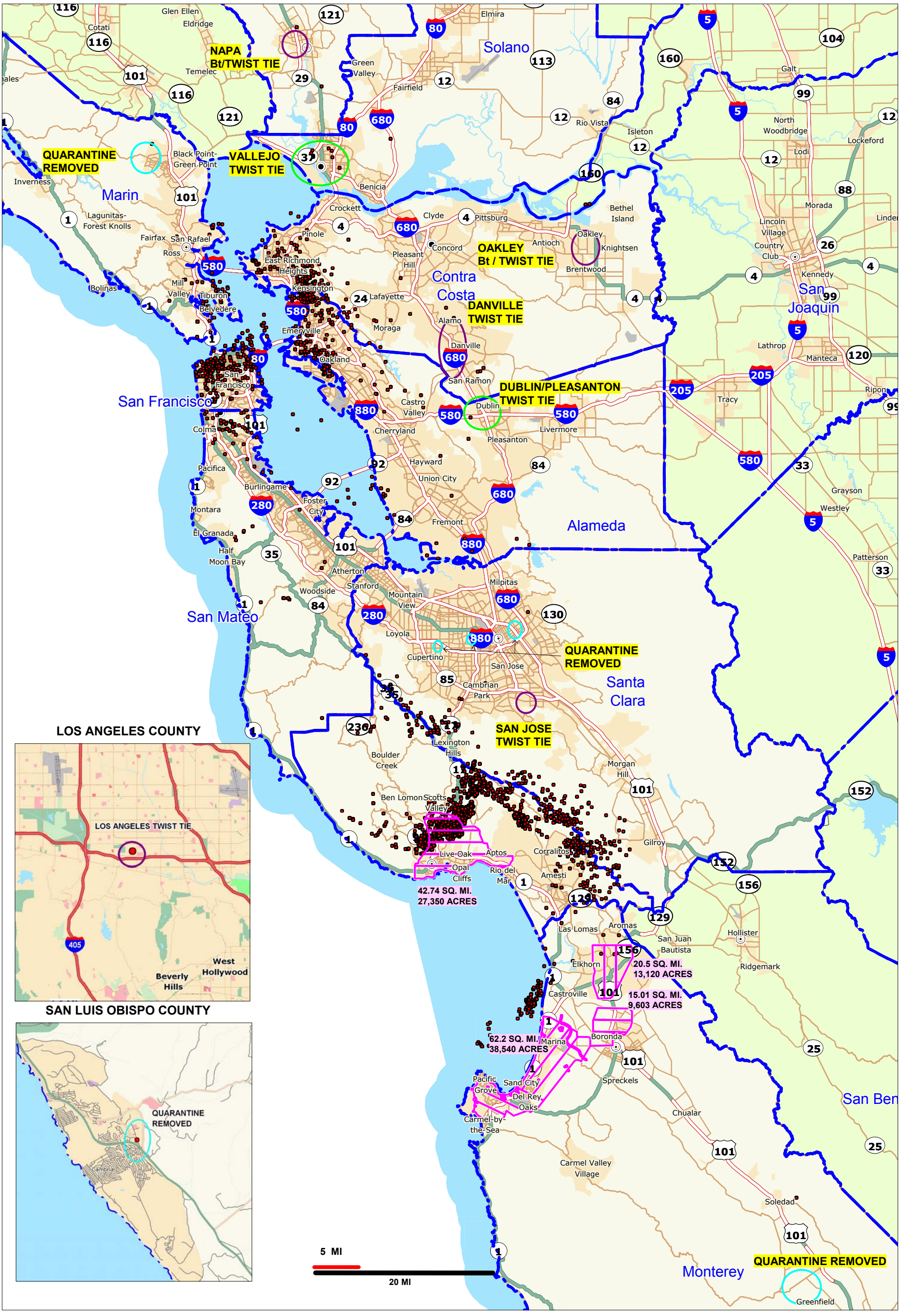
Alfalfa	*Medicago sativa*
Almond	*Prunus amygdalus*
Apple	*Malus* spp.
Apricot	*Prunus armeniaca*
Avocado	*Persea americana*
Blackberry, Boysenberry, Raspberry	*Rubus* spp.
Blueberry	*Vaccinium sp.*
Broad Bean	*Vicia faba*
Broccoli, Cabbage, Cress, Mustard, Radish, and Turnip, ect.	*Brassica* spp.
California Black Walnut, Butternut	*Juglans* spp.
Carrot, Queen Anne's Lace	*Daucus* spp.
Celery	*Apium graveolens*
Chile Pepper	*Capsicum frutescens*
Chinese Gooseberry	*Actinidia chinensis*
Citrus	*Citrus* spp.
Clover	*Trifolium* spp.
Common Bean	*Phaseolus vulgaris*
Common Plantain	*Plantago major*
Corn	*Zea mays*
Cucumber	*Cucumis sativus*
Currant	*Ribes spp.*
Feijoa, Pineapple Guava	*Feijoa sellowiana*
Grape	*Vitis* spp.
Hops	*Humulus lupulus*
Kiwifruit	*Actinidia deliciosa*
Kumquats	*Fortunella* spp.
Litchi	*Litchi chinensis*
Loquat	*Eriobotrya* spp.
Macadamia	*Macadamia* spp.
Mango	*Mangifera* spp.
Mint	*Mentha* spp.
Narrowleaf Plantain	*Plantago lanceolata*
Nectarine	*Prunus persica* var *nectarina*
Olive	*Olea europaea*
Parsley	*Petroselinum* spp.
Passionfruit	*Passiflora edulis*
Pea	*Pisum sativum*
Peach	*Prunus persica*
Pear	*Pyrus* spp.
Persimmon	*Diospyros* spp.
Plum	*Prunus domestica*
Potato	*Solanum tuberosum*

Partial LBAM Host List - Agriculture

Pumpkin	*Cucurbita* spp.
Quince	*Cydonia* spp.
St. John's Wort	*Hypericum perforatum*
Strawberry	*Fragaria* spp.
Sweet Cherry	*Prunus avium*
Sweet Pea	*Lathyrus* spp.
Tomatoes	*Lycopersicum* spp.
Wild Radish	*Raphanus spp.*

LIGHT BROWN APPLE MOTH
PROJECT ACTIVITY
2007

ATTACHMENT I



LOS ANGELES COUNTY

SAN LUIS OBISPO COUNTY

cdfa

- 2007 TRAP FIND
- QUARANTINE REMOVED
- ERADICATION AREA
- ERADICATION COMPLETED
- AERIAL TREATMENT 2007